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To guard against any suspicion that these figures—the very remarkable agreement of which with each other in certain respects, and equally remarkable disagreement in others, is patent—are the result of discriminative selection (a kind of survival of the fittest, in fact), I beg to say that they are the direct consequence of adopting the Equatoreal-numbers 98758·0 and 86350·0. Each pendulum *had* an equatoreal vibration number which was not known. We have a right to assume any number for any pendulum, in any given condition, which will best satisfy the observations. I propose these, and show how well they fit the observations. That is evidence in their favour. If they are right they are a key to help to discriminate and to indicate facts. Thus it appears, beyond any doubt, that the condition of B, when in Grischow's hands, was not the same as when in La Caille's; and the Vibration-number is accordingly dropped, as not belonging to the differential series.

I have gone further in this examination than I intended, in the hope of finding other reasons, in the discordance *inter se* of the results, for their non-appearance in any collection of pendulum observations. That the Revel and Dorpat results are now apparently irreconcilable with the more recent results of 108 years later is true; but was this foreseen? And is there even now the *smallest* ground for doubting the Arensburg value?

Calcutta, May 24, 1879.

Note on the Semi-diameter of the Moon.

By E. Neison, Esq.

The results obtained by Professor Pritchard from the measurement of the photographs of the Moon taken at Oxford, and given in the *Monthly Notices* for June, p. 447, are of considerable interest. Unfortunately, as Professor Pritchard gives no details of the method he employed, beyond stating that it is very similar to that employed by Wichmann (*Ast. Nach.*, 1847), it is impossible to say how far he has succeeded in eliminating the systematic errors which are incidental to this work. Professor Pritchard makes the semi-diameter of the Moon equal to

$$15' \quad 34'{\cdot}175.$$

From a careful discussion of nearly eleven hundred observations made with apertures of different sizes, at the Observatories of Greenwich, Oxford (Radcliffe), and Washington, I deduced the value

$$15' \quad 33''{\cdot}37 + 4''{\cdot}10\,(1 + 0{\cdot}70 \times \text{aperture in inches}).$$

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For the eight-inch Transit-Circle of the Greenwich Observatory this corresponds to a semi-diameter of

$$15'\ 33''{\cdot}99,$$

the result from 350 measures being

$$15'\ 33''{\cdot}97.$$

For the five-inch Transit-Circle of the Radcliffe Observatory the formula gives a semi-diameter of

$$15'\ 34''{\cdot}28,$$

whilst the mean of over 200 measures, between 1862 and 1877, gives

$$15'\ 34''{\cdot}35.$$

It may be added that this empirical formula agrees closely with the theoretical formula, founded on the assumption that the differences in semi-diameter obtained from instruments of different aperture vary as the diffraction disks and the amount of light.

Applying this formula to the semi-diameter of the Moon in a 13-inch Reflector, the result is obtained of

$$15'\ 33''{\cdot}78$$

for the value of the semi-diameter. Adding the photographic irradiation, which my experiments indicate to be about $+''0{\cdot}30$, the resulting photographic semi-diameter should be

$$15'\ 34''{\cdot}08.$$

This agrees very closely with the result obtained by Professor Pritchard.

How far this coincidence is fortuitous cannot be said; for until we know the method by which these measures have been reduced, it is impossible to say how far the above result indicates the true photographic semi-diameter, or how far it may be vitiated by the effect of the inequalities on the limb. In the method employed by Wichmann the effect of these inequalities is not eliminated; and if Professor Pritchard has employed the same method they will not have been eliminated from the above result.

Professor Pritchard compares the remarkably accordant results obtained by himself with the results obtained by Wichmann, apparently with the view of showing that the results obtained by measuring photographs will be far superior to the results of measurements with the Heliometer. The comparison, however, fails completely. Professor Pritchard's column III. gives the difference between his own separate and mean values, whereas his

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column IV. gives the result of comparing the separate Heliometer determination with the very faulty semi-diameter (Burckhardt's) employed in the *Berliner Jahrbuch* for 1844–1845. To render the comparison fair, Professor Pritchard should have compared his separate results with the semi-diameter from Burckhardt's Tables. He would then have found his separate results as utterly discordant as those of the Heliometer appear to be.

As Professor Adams has pointed out, Burckhardt's tabular semi-diameter is vitiated by a large error, an error which may amount to some 2″, whilst his mean semi-diameter is more than 1″ too small. Correcting Burckhardt's semi-diameter for the effect of these errors, all the large discordances in column IV. disappear, leaving the separate results of the Heliometer sensibly as accordant as those from the photographs.

Professor Pritchard remarks that the mean semi-diameter (Hansen's) employed in the *Nautical Almanac* appears to be

15′ 34″·10.

I do not know how Professor Pritchard has arrived at this conclusion, but it seems quite erroneous. In the *Nautical Almanac* Hansen's tabular semi-diameter is employed unaltered. Hansen clearly states, in the introduction to his Tables, that he adopts 57′ 0″ for the mean value of the Moon's horizontal equatoreal parallax, and therefore, as Table XXII. shows, the mean value of the tabular semi-diameter is

15′ 33′·47,

no less than

0″·63

smaller than supposed by Professor Pritchard. Instead, therefore, of the photographic semi-diameter differing from the *Nautical Almanac* semi-diameter by the very small amount of

+0″·075,

it differs by the rather considerable amount of

+0″·705,

or nearly ten times as much.

As Hansen's Tables are not very intelligible on a mere cursory inspection, it is important that this correction should be made, to prevent erroneous ideas as to the real value of Hansen's semi-diameter.